

# **Moving SARB Software from an SGI Environment to an IBM Open Source Environment**

## **1.0 Task Description**

Prepare SARB software to process on a new IBM Linux cluster at the ASDC.

## **2.0 Background**

Jim Donaldson of Raytheon converted the Release 4 Instantaneous SARB Subsystem software to run on a MacIntosh G5 platform using the same Open Source environment as the new ASDC IBM Linux cluster. The deliverables from this effort include the converted software and a document outlining the conversion process. As the SARB DMT is responsible for maintaining this software in collaboration with the CERES Science Team, it is imperative that the SARB DMT understand the changes made during the G5 conversion process.

The G5 conversion effort began with the Release 4 version of the Instantaneous SARB Subsystem software that was placed under CERES CM for use in the production environment. As errors allowed and undetected in the SGI environment were encountered in the G5 environment, notice was sent to the SARB DMT. The indicated corrections were evaluated, and if deemed appropriate the corrections were made to the copy of the Version 4 software maintained in a CVS environment on the SCF hardware. (It should be noted that most, if not all, of the corrections indicated were deemed appropriate for implementation.)

## **3.0 Action Plan**

Review each module included in the G5 software for modifications and classify the modifications according to the categories listed in Table 1. After reviewing the number of differences and their categories, determine which modifications need to be implemented together for testing purposes and develop schedule shown in Table 10. Assign responsibility among SARB Data Management Team members. Implement appropriate modifications, test, and document results.

**Table 1: Categories of G5/SGI Differences**

Category	Description
A	G5 modifications necessary for the code to function in the Linux environment
B	G5 modifications that correct errors not previously detected in the SGI environment that have the potential to produce unpredictable results
C	G5 modifications that improve the efficiency of the software but do not change its functionality
D	G5 modifications deemed necessary for unforeseen reasons.
E	G5 modifications that should NOT be duplicated
F	SGI modifications that need to be retained
G	SGI modifications that need to be eliminated

**Process:**

1. Create the directories /CERES/sarb-c/Jims, /CERES/sarb-c/Ours, and /CERES/sarb-c/Diff\_Files on the CERES SCF environment.
2. Develop a script that performs an UNIX diff command for each module in /CERES/sarb-c/Jims against the same-named module in /CERES/sarb-c/Ours, piping the results to an ASCII file named “modulename”.diff.
3. Perform a long listing of the files in /CERES/sarb-c/Diff\_Files, piping the results to an ASCII file named diffsizes.20050210, where the string “20050210” is the file creation date.
4. Create a tar file of the diff output files and the long list of filenames. Name the file G5\_diffout.20050210, where the string “20050210” is the data the contents inside the tar file were created.
5. Commit output from steps 2 through 4 to CVS.
6. Assign diff output files to SARB DMT members for review and classification.
7. Prepare a schedule of which modifications need to be made simultaneously.
8. Indicate initial status of changes for each module in Table 2 through Table 8. Possible initial values include the following statuses.
  - No differences
  - Not duplicating G5 differences
  - Maintaining SGI differences
  - G5 differences to be implemented according to Schedule
9. Test changes as indicated by the schedule indicated in Table 10 and document results in the Comments columns in Table 2 through Table 8. Follow procedures described in Section 4.
10. Once all changes have been made, repeat the diff process described in steps 2 through 5, naming the output files according to the file creation date.
11. Repeat steps 6 through 10 until there are no changes left to be made.
12. Begin transfer to IBM Linux cluster at ASDC once it is available and all appropriate modifications have been made..

## 4.0 Test Procedures

### **Environment:**

All testing will occur at the SCF.

### **Baseline:**

1. Make a baseline run using the modules in the subdirectory /CERES/sarb-c/Ours for both the Instantaneous and the Synoptic SARB Subsystems.
2. Indicate the names, including path, of the output products and PCFs in the comments section of Table 10.

### **For each phase indicated by Table 10:**

1. Complete associated changes and make test run. Again, record the output file names in the comments column.
2. Compare the outputs against the previous run using the comparison software in the test\_suites directory.
3. Evaluate and determine cause of differences. Note differences and causes in comments section of Table 10.
4. Commit output files, including test\_suite comparison code output, to CVS.
5. Test Synoptic SARB Subsystem where indicated in Table 10. It is not necessary to test the Synoptic SARB Subsystem at each phase.

### **Output File Naming Convention:**

The environment variable PS5, used in building the output file names, must include a string indicating the phase associated with the test run.

## 5.0 Instantaneous SARB Subsystem Modules and G5/SGI Difference Classifications

The differences between the G5 version and the SGI version of the Instantaneous SARB Subsystem are identified in Table 2 through Table 8. A summary of the differences, grouped by category, is shown in Table 9.

**Table 2: Instantaneous SARB MODIS Aerosol Pre-Processor Modules**

Module ID	Module Name	Assigned	Comments
M-1	MonMODISAer_Daily.f90		No difference
M-2	MonMODISAer_Error.f90		No difference
M-3	MonMODISAer_Init.f90		No difference
M-4	MonMODISAer_Meta.f90		No difference
M-5	MonMODISAer_MonthProcess.f90		No difference

**Table 2: Instantaneous SARB MODIS Aerosol Pre-Processor Modules**

Module ID	Module Name	Assigned	Comments
M-6	Makefile		

**Table 3: Instantaneous SARB Surface Albedo Pre-Processor Modules**

Module ID	Module Name	Assigned	Comments
M-7	Hr_Process_Daily.f90		No difference
M-8	Init_PreSS5_Daily.f90		No difference
M-9	InstSARB_SfcAlbHist_Drv.f90		No difference
M-10	PreSS5_DayMerge_DayProcess.f90		No difference
M-11	PreSS5_DayMerge_Drv.f90		No difference
M-12	PreSS5_DayMerge_Init.f90		No difference
M-13	PreSS5_DayMerge_Meta.f90		No difference
M-14	PreSS5_DayMerge_WrapUp.f90		No difference
M-15	PreSS5_DayProcess_Drv.f90		No difference
M-16	PreSS5_Params.f90		No difference
M-17	WrapUp_PreSS5_Daily.f90		No difference
M-18	Makefile		

**Table 4: Instantaneous SARB Main-Processor Modules**

Module ID	Module Name	Assigned	Comments
M-19	crsdg_io.f90		No difference
M-20	CRSDG_Output_Prep.f90		TYPE F, we implemented a newer change that isn't in CVS yet. Ignore, but update CVS.
M-21	Foot_Drv.f90		TYPE E, only changes are debug options
M-22	Init_SS5.f90		No difference
M-23	Inst_SfcAlb.f90		No difference
M-24	InstSARB_Ingest.f90		No difference
M-25	InstSARB_IO_Params.f90		No difference
M-26	InstSARB_Meta.f90		No difference

**Table 4: Instantaneous SARB Main-Processor Modules**

Module ID	Module Name	Assigned	Comments
M-27	SARB_Drv.f90		No difference
M-28	SARBInProduct_Utils.f90		No difference
M-29	SfcAlb_Init.f90		No difference
M-30	SSFA_AOT.f90		TYPE F, we have a newer version of code.
M-31	SSFA_IOErr_Params.f90		No difference
M-32	Wrap_Up_SS5.f90		No difference

**Table 5: Instantaneous SARB HDF Post-Processor Modules**

Module ID	Module Name	Assigned	Comments
M-33	crs2hdf.f90		No difference
M-34	crs2hdf_params.f90		No difference
M-35	Makefile		

**Table 6: HDF to Binary Modules**

Module ID	Module Name	Assigned	Comments
M-36	hdf2crsb.f90		No difference
M-37	hdf_read.f90		No difference
M-38	Makefile		

**Table 7: Instantaneous SARB Monthly QC Post-Processor Modules**

Module ID	Module Name	Assigned	Comments
M-39	InstSARB_MonQC_Drv.f90		No difference
M-40	MonQCERR_Params.f90		No difference
M-41	MonReg_Report.f90	SMZ	TYPE B, Maintain G5 change. Initialize variable sooner.
M-42	SARB_HQC_Pointers.f90		No difference
M-43	SARB_MonQC_Error.f90		No difference
M-44	SARB_MonQC_FileOpen.f90		No difference

**Table 7: Instantaneous SARB Monthly QC Post-Processor Modules**

Module ID	Module Name	Assigned	Comments
M-45	SARB_MonQC_HourProc.f90		No difference
M-46	SARB_MonQC_Init.f90		No difference
M-47	SARB_MonQC_Params.f90		No difference
M-48	SARB_MonQC_WrapUp.f90		No difference
M-49	Single_QC_Read.f90	SMZ	TYPE B, Maintain G5 change. Do array bounds check
M-50	Makefile		

**Table 8: SARBlib Modules**

Module ID	Module Name	Assigned	Comments
M-51	aerosols_0403.f		No difference
M-52	alblib_data.f90		No difference
M-53	Ancill_Init.f90		No difference
M-54	aotfit.f90	TEC	TYPE B, keep the principal of this change to prevent imaginary number, can be done better
M-55	aqua_wnflt_0404.f		No difference
M-56	chou_routines.f		No difference
M-57	Collins_assimilation.f90		No difference
M-58	Constrain_Params.f90		No difference
M-59	Control_Mod.f90		No difference
M-60	Convert_OptDepth.f90		No difference
M-61	DrivIngest.f90		No difference
M-62	DrivTab_Var.f90		No difference
M-63	extras.f90		No difference
M-64	FL_IO_Params.f90		No difference
M-65	FL_Pass_Interface.f90	SMZ	TYPE B, Maintain G5 code, simple math change to prevent LOG(0) and e^INF
M-66	FL_SetUp.f90		No difference

**Table 8: SARBlib Modules**

Module ID	Module Name	Assigned	Comments
M-67	FLSA_LUT_Utils.f90	SMZ	TYPE B, Maintain G5 code, add USE statement to allow REAL4_DFLT, and check for nighttime, return if true
M-68	fuinput.f90		TYPE E, ignore change, for debug purposes only.
M-69	fuoutput.f90		No difference
M-70	fuprint.f90		No difference
M-71	GADS_Aer.f90		No difference
M-72	gfdl_aer_clim.f90		No difference
M-73	IGBP_AdjSnowIce.f90	SMZ	TYPE B Maintain G5 change, remove unnecessary line that causes array out of bounds.
M-74	IGBP_Utils.f90		No difference
M-75	Lev_Isolate.f90		No difference
M-76	ma_tip.f90		No difference
M-77	match_profiles.f90	TEC	TYPE F&A We have a lot of new stuff added here, verify quality of SGI changes. Also may be a necessary change for G5 conversion in TYPE declarations.
M-78	misc_0403.f	SMZ	TYPE F&B Maintain divide by zero changes for G5. Keep new changes made to SGI.
M-79	MonMODISAer_ErrParams.f90		No difference
M-80	MonMODISAer_Params.f90		No difference
M-81	Monthly_AerHist_Utils.f90		No difference
M-82	Monthly_SfcAlb_IO.f90		No difference
M-83	No_Cloud.f90		No difference
M-84	Profile_Params_CRS.f90		No difference
M-85	Profile_Params_SYN.f90		No difference
M-86	QC_Accum.f90		No difference
M-87	QC_Fin.f90	SMZ	TYPE B&E. Ignore change to Icnt_TuneErr array. Maintain G5 change with regard to format statements.

**Table 8: SARBlib Modules**

Module ID	Module Name	Assigned	Comments
M-88	QC_Init.f90		TYPE E. Already implemented change.
M-89	rad_multi_0403.f90		No difference
M-90	RadParams.f90		No difference
M-91	SARB_Error_Process.f90		TYPE E. Ignore change, for debug purposes only.
M-92	SARB_FOV_Albedo.f90		No difference
M-93	SARB_General.f90		No difference
M-94	SARB_IO_Utils.f90		No difference
M-95	SARB_OutVar.f90		No difference
M-96	SARB_QC_Params.f90		TYPE F. Maintain SGI change.
M-97	SARB_QC_Params_CRS.f90		TYPE F. Maintain SGI change.
M-98	SARB_QC_Params_SYN.f90		TYPE F. Maintain SGI change.
M-99	SARB_Var.f90		No difference
M-100	SARBAer_Utils.f90		No difference
M-101	SARBAer_Var.f90		No difference
M-102	SARBIInput_Params.f90		No difference
M-103	SARBIInput_Utils.f90		No difference
M-104	seiji_k2b.f90	SMZ	TYPE A. Maintain G5 change. Change in logic for data statements.
M-105	seiji_solver_0403.f90	SMZ	TYPE B. Maintain G5 change. Fixes divide by 0.
M-106	seiji_twostreamsolv_sw_v20.f	SMZ	TYPE B. Maintain G5 changes that fix divide by 0 and Real4 vs. Real8 issues.
M-107	sfcalb_history.f90		TYPE E. Ignore changes, debug only.
M-108	SigmaIngest.f90		No difference
M-109	SigTab_Var.f90		No difference
M-110	sktbl_ht02a.f90		No difference
M-111	Spectral_Dat.f90		No difference

**Table 8: SARBlib Modules**

Module ID	Module Name	Assigned	Comments
M-112	Spectral_Sfc.f90	TEC	TYPE B&E. Ignore debugs, maintain G5 changes for divide by 0, returns, and INFs.
M-113	taucorr.f90		No difference
M-114	Tune_Code.f90	SMZ	TYPE B&E. Ignore debugs, maintain G5 change of array indexing.
M-115	TuneDrive.f90	SMZ	TYPE B. Maintain G5 change to avoid divide by 0.
M-116	UpTropHum.f90		No difference
M-117	uvcor_all.f90		TYPE E. Ignore debugs.
M-118	VMax_Min.f90		No difference
M-119	WindowFilter.f		No difference
M-120	With_Cloud.f90	SMZ	TYPE A&E. Ignore debugs, maintain G5 changes to initialize array.
M-121	wssacomp.f90		No difference
M-122	ZJIN_Mod.f90	TEC	TYPE A. Maintain G5 changes for DATA statements required by G5.
M-123	ZJIN_Params.f90	TEC	TYPE A. Maintain G5 changes for DATA statements required by G5.
M-124	Makefile.CRS		

**Table 9: Summary of Differences Grouped by Category**

Category	Number of Occurrences
A	5
B	13
C	0
D	0
E	10
F	7
G	0

## 6.0 Schedule of Conversion

For manageability purposes, the necessary modifications will be made and tested incrementally according to the schedule shown in Table 10.

**Table 10: Schedule of Implementation**

Phase	Due Date	Category	Module ID	Comments
Baseline Instantaneous	2/22/05			
Baseline Synoptic	2/24/05			
1	3/2/05	A	M-120	
1		B	M-41	
1		B	M-49	
1		B	M-65	
1		B	M-67	
1		B	M-73	
1		B	M-78	
1		B	M-114	
1		B	M-115	
Synoptic	3/9/05			
2	3/15/05	A	M-104	
3	3/18/05	B	M-87	
4	3/22/05	B	M-105	
5	3/24/05	B	M-106	
Synoptic	3/25/05			
6	3/29/05	A	M-77	
7	4/5/05	A	M-122	
7		A	M-123	
8	4/8/05	B	M-54	
9	4/12/05	B	M-112	
Synoptic	4/15/05			

## 7.0 Priority Status Snapshots

Workload priorities for SARB DMT members in regard to the SGI to IBM Linux conversion effort are listed in Table 11.:

**Table 11: Priority Snapshots**

Snapshot Date	Priorities - SMZ	Priorities - TEC
2005/02/09	37% SGI to IBM Linux 37% S4P 26% other	Priority 1 is the Regrid MOA Subsystem changes. Priority 2 is the SCF SARB disk space cleanup Priority 3 is the SGI to IBM Linux

## **8.0 Configuration Management**

During this conversion process by the CERES SARB DMT, it is necessary to maintain output files regarding the differences between the two versions of the Instantaneous SARB Subsystem software. Maintaining the information in these files provides an exact history of changes actually implemented by the SARB DMT.

The following items related to the conversion process are under configuration management:

- Output files listed in Steps 2, 3, 4 of the process outlined in Section 3.
- Output files generated in the testing process outlined in Section 4.
- Tar file of Jim Donaldson's converted version of the Instantaneous SARB Subsystem software
- Documents posted to the CERES SARB DMT Web site related to the SGI to Open Source conversion effort.

A CVS repository on the SCF platform is set up to track changes and control the configuration of these items. All files are named according to creation date, with the baseline files being those with the earliest dates. Changes made are tracked through the process outlined in Section 3.